

## DESCRIPTIONS AND NOTES ON THE GENUS *PARADOSSENUS* IN THE NEOTROPICAL REGION (ARANEAE, TRECHALEIDAE)

Antonio D. Brescovit<sup>1</sup>; Josué Raizer<sup>2</sup> and Maria Eugênia C. Amaral<sup>2</sup>: <sup>1</sup>Lab.

Artrópodes Peçonhentos, Instituto Butantan, Av. Vital Brasil, 1500, CEP 05503-900, São Paulo, SP, Brazil; and <sup>2</sup>Depto de Biologia, Centro de Ciências Biológicas e de Saúde, Universidade Federal de Mato Grosso do Sul, Campo Grande, MS, Brazil, C. Postal 549, CEP 79070-900.

**ABSTRACT.** Three Brazilian species of the genus *Paradossenus* F.O. Pickard-Cambridge 1903 are included in this paper: *Paradossenus minimus* (Mello-Leitão 1940), whose holotype was located and is here redescribed; *Paradossenus corumba* new species is described from Mato Grosso do Sul, Brazil and preliminary data on its biology are presented. Morphological data and new records of *P. longipes* (Taczanowski 1874) are included.

**Keywords:** *Paradossenus*, Trachaleidae, Araneae, Neotropical region

The genus *Paradossenus* F.O. Pickard-Cambridge 1903 was revised by Sierwald (1993) and includes three neotropical species: *P. longipes* (Taczanowski), *P. pulcher* Sierwald 1993 and *P. caricoi* Sierwald 1993. In the same paper, she synonymized the monotypic genus *Xingusiella* (type species *X. minima*), described by Mello-Leitão (1940) based on the illustration of the epigynum and characters presented in Mello-Leitão's description. The author also suggested that "*P. minimus* might be a fourth valid species in the genus *Paradossenus*" (Sierwald 1993).

Recently the holotype of *Xingusiella minima* was found in the MNRJ collection, mixed with other material of the family Pisauridae. The examination of this specimen confirms Sierwald's supposition that the specimen belongs to this genus, and the species is here redescribed. While examining other Brazilian collections more *P. longipes* material was found, and its geographical distribution is here extended to include southern Brazil and northern Argentina specimens. A new species, *P. corumba*, much smaller than *P. minimus*, was collected by the second author (JR) in the project "Biodiversidade da Fauna Associada a Macrófitas Aquáticas", which was being developed in southern Pantanal floodplain, Corumbá, Mato Grosso do Sul, Brazil and was organized by the third author (MEA). This

new species is common in the study area, enabling preliminary observations on its biology.

### METHODS

The material examined belongs to the following collections: IBSP, Instituto Butantan, São Paulo (A.D. Brescovit); MCN, Museu de Ciências Naturais, Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre (E.H. Buckup); MCTP, Museu de Ciência e Tecnologia, Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre (A.A. Lise); MNRJ, Museu Nacional do Rio de Janeiro, Rio de Janeiro (A. Kury); ZUFMS, Coleção Zoológica de Referência da UFMS, Universidade Federal de Mato Grosso do Sul, Campo Grande (L.O.I. Souza).

The description format follows Brescovit & Höfer (1994) and the terminology used for the internal structures of the genitalia follows Sierwald (1993, 1996). All measurements are in millimeters. The epigyna were cleared in clove oil to study internal structures. Data on aquatic plant association, web type and prey capture strategies of *Paradossenus corumba* were obtained through field observations of 61 individuals, where 35 were studied by an animal focal method (*sensu* Lehner 1979; total of 175 minutes of observations divided in 35 sessions of five minutes each). These data were collected in temporary ponds in the

southern Pantanal floodplain (between 19°22'–19°33'S and 57°02'–57°03'W) from July 1994–April 1997.

*Paradossenus* F.O. Pickard-Cambridge

*Paradossenus* F.O. Pickard-Cambridge 1903: 155, (type species by original designation, *Paradossenus nigricans* F.O. Pickard-Cambridge [= *Dolomedes longipes* Taczanowski 1874]). Sierwald 1993: 55.

*Xingusiella* Mello-Leitão 1940: 23, (type species by original designation, *X. minima* Mello-Leitão. First synonymized by Sierwald 1993: 55. Carico 1993: 231.

**Diagnosis.**—*Paradossenus* can be distinguished from other trechaleids by at least four characters, three of which are presumably synapomorphies: male chelicerae with distinct elongated groove leading to the base of fang on the anterior surface of paturon (Figs. 6, 19; Sierwald 1993, fig. 11), leg I extremely long, and presence of a distal tegular projection, not pierced by the duct, in the male palp (Figs. 1, 17, 19; Sierwald 1990, fig. 35; 1993, fig. 12). An additional character would be the presence of slightly to moderately-recurved posterior eye row (Sierwald 1990, figs. 29, 30). The presence of four cheliceral teeth on the retromargin, a character used as diagnostic by Sierwald (1990), was inconsistent. The species included in this work had a retromargin with three teeth (Fig. 12).

*Paradossenus corumba* Brescovit & Raizer  
new species

Figs. 1–6; 11–17; 23

**Types.**—Male holotype from Corumbá, Mato Grosso do Sul, Brazil, 1994, J. Raizer col., deposited in IBSP 6901; 1♂ & 1♀ paratypes with same data of holotype, deposited in IBSP 6902 and 6903; 1♀ & 4 immatures from Passo do Lontra, Abobral Pantanal sub-region, Corumbá, Mato Grosso do Sul, Brazil, 27 November 1994, J. Raizer col., deposited in IBSP 6904.

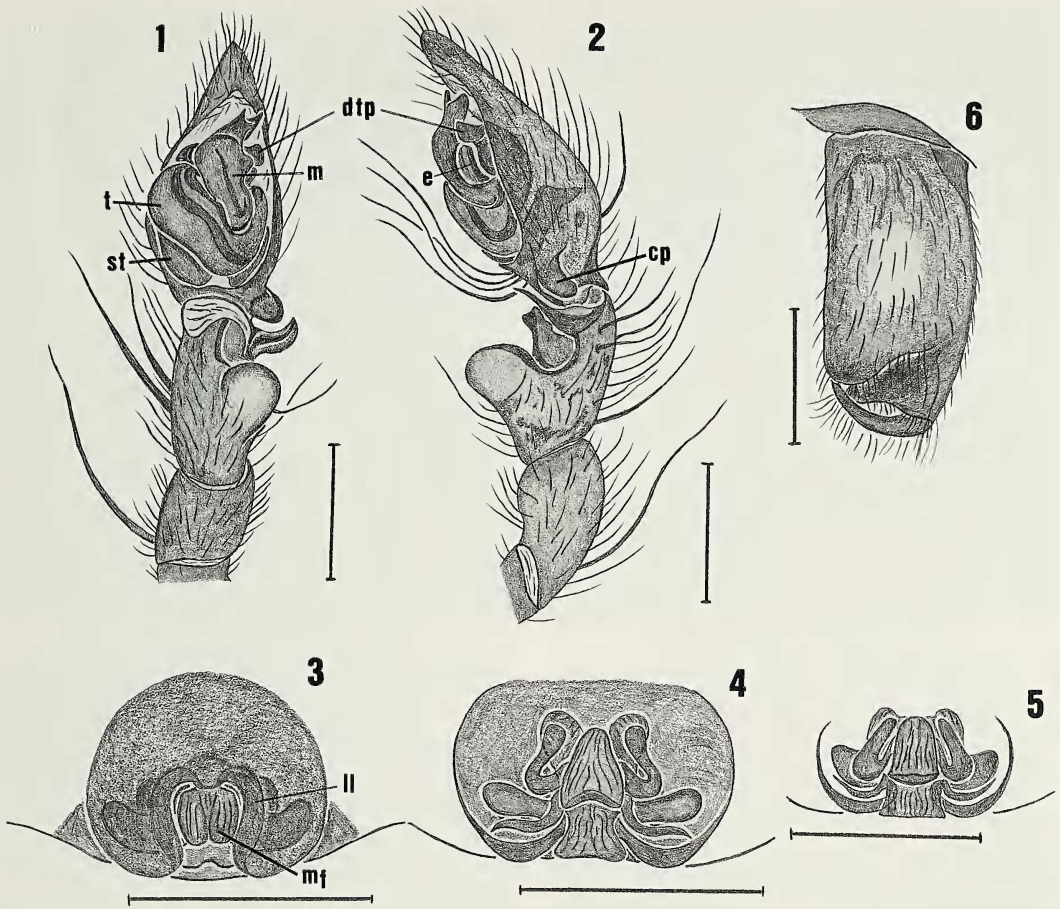
**Etymology.**—The specific name is a noun in apposition taken from the type locality.

**Diagnosis.**—The male of *Paradossenus corumba* is distinguished from *P. longipes* (Fig. 13; Sierwald 1990, figs. 34–36) by presence of a retrolateral projection on the base of the cymbium (Figs. 2, 16) and a median apophysis with a bifid distal branch (Figs. 1, 17); the female of *P. corumba* differs from *P. minimus* by the sclerotized internal border of

lateral lobes and middle field with a median depression (Figs. 3, 14).

**Description.**—*Male:* (holotype). Coloration: carapace orange with grayish border and with brown median dorsal band. Chelicerae yellow. Endites, labium and sternum yellow to white. Legs orange with brown longitudinal bands in all articles. Abdomen orange-brown, dorsally with grayish transversal bands and three pairs of longitudinal white spots. Ventrally shiny white. Total length 2.65. Carapace 1.30 long, 1.20 wide. Clypeus 0.10. Eye diameters and interdistances: AME 0.10, ALE 0.08, PME 0.11, PLE 0.12; AME-AME 0.05, AME-ALE contiguous, PME-PME 0.08, PME-PLE 0.13, ALE-PLE 0.18. MOQ length 0.22, anterior width 0.21, posterior width 0.31. Chelicerae with elongated groove, deep, next to base of fang on the anterior surface (Figs. 6, 11) and 3 promarginal teeth being the median largest and 3 retromarginal denticles (Fig. 12). Labium 0.20 long, 0.17 wide. Sternum 0.75 long, 0.67 wide. Abdomen 1.40 long. Leg measurements: I -femur 2.40; patella 0.70; tibia 2.40; metatarsus 2.40; tarsus 1.00; total 8.90. II -2.00; 0.60; 1.90; 1.90; 0.80; 7.30. III -1.30; 0.40; 0.90; 1.00; 0.35; 3.95. IV -2.10; 0.50; 1.65; 2.10; 0.70; 7.05. Leg spination: tibia I-II v2-2-0; III-IV v2-2-2. Legs with plumose setae (Fig. 15). Bothrium of trichobothria with semicircular rim presenting longitudinal and slender striations (Fig. 13). Palp: retrolateral tibial apophysis subtriangular, very slender at tip; retrolateral ventral projection accentuated and globose (Figs. 1, 16); cymbium with retrolateral basal projection (Figs. 2, 16); tegulum with sperm ducts forming two loops; conductor inconspicuous; median apophysis with two branches, one median rounded and the other distal bifid (Figs. 1, 17).

*Female:* (IBSP 6904). Coloration as in male except legs with more accentuated bands on the articles and dorsum of abdomen darker. Total length 2.30. Carapace 1.20 long, 1.10 wide. Clypeus 0.07 high. Eye diameters and interdistances: AME 0.10, ALE 0.05, PME 0.12, PLE 0.11; AME-AME 0.03, AME-ALE 0.02, PME-PME 0.06, PME-PLE 0.12, ALE-PLE 0.21. MOQ length 0.23, front width 0.18, back width 0.26. Chelicerae not modified, with 3 promarginal teeth, the second basal being larger than others and 3 large retromarginal teeth. Labium 0.15 long, 0.20 wide.



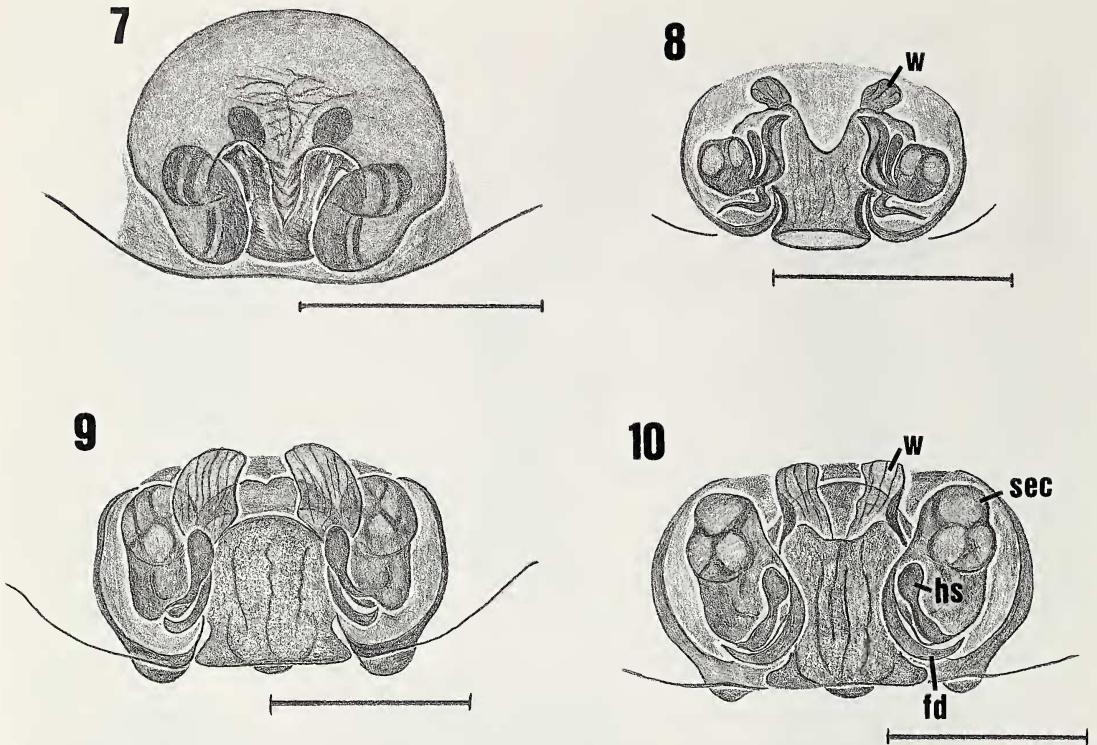
Figures 1-6.—*Paradosenus corumba* new species, male. 1, Left palp, ventral view; 2, Left palp, retrolateral view; 3, Epigynum in ventral view; 4, Epigynum in dorsal view; 5, Epigynum in dorsal view (variation from Porto Cercado, Mato Grosso do Sul); 6, Male chelicera, anterior surface. *Abbreviations:* cp, basal projection of cymbium; dtp, distal tegular projection; e, embolus; ll, lateral lobes; ma, median apophysis; mf, middle field; st, subtegulum; t, tegulum. Scale bars = 0.25 mm.

Sternum 0.65 long, 0.60 wide. Abdomen 1.30 long. Leg measurements: I -femur 1.50; patella 0.50; tibia 1.40; metatarsus 1.40; tarsus 0.55; total 5.35. II -1.40; 0.50; 1.25; 1.20; 0.50; 4.85. III -1.05; 0.30; 0.70; 0.80; 0.30; 3.15. IV -1.50; 0.45; 1.05; 1.55; 0.50; 5.15. Leg spination as in male. Epigynum: epigynal folds very narrow; middle field short, not covering the epigastric furrow, with an anterior median depression; lateral lobes with narrow border sclerotized and rounded posteriorly (Figs. 3; 14). Vulva: wing of copulatory duct elongated, enlarged distally; true spermathecae slender, curved medially and with rounded head; elongated secondary spermathecae, transversally disposed (Fig. 4).

*Variation:* Two males: total length 2.65–

2.70; carapace 1.20–1.30; femur I 2.00–2.40. Six females: total length 2.30–3.50; carapace 1.20–1.50; femur I 1.50–2.10. The females from Porto Cercado are darker, and the head of true spermathecae can be very slender (Fig. 5).

**Natural history.**—*Paradosenus corumba* was observed associated with nine aquatic plants: *Eichhornia azurea* (Sw.) Kunth and *E. crassipes* (Mart.) Solms-Laub. (Pontederiaceae), *Echinodorus paniculatus* Mich. (Alismataceae), *Nymphaea amazonum* Mart. & Zucc. (Nymphaeaceae), *Salvinia auriculata* Aublet (Salviniaceae), *Phyllanthus fluitans* Müll. (Euphorbiaceae), *Panicum mertensii* Roth (Poaceae), *Ludwigia inclinata* (L.f.) Raven (Onagraceae), and *Pistia stratiotes* L. (Ar-



Figures 7–10.—Species of *Paradossenus*, females. 7, 8.—*Paradossenus minimus*. 7, Epigynum in ventral view; 8, Epigynum in dorsal view. 9, 10. *P. longipes*, variation of epigynum in dorsal view. 9. Reserva Florestal Adolfo Ducke, Manaus, Amazonas; 10, São Leopoldo, Rio Grande do Sul. Abbreviations: fd, fertilization duct; hs, head of true spermathecae; sec, secondary spermathecae; w, wing of copulatory duct. Scale bars = 0.25 mm.

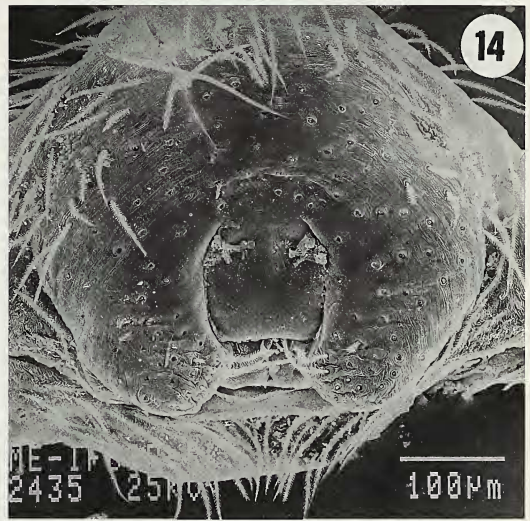
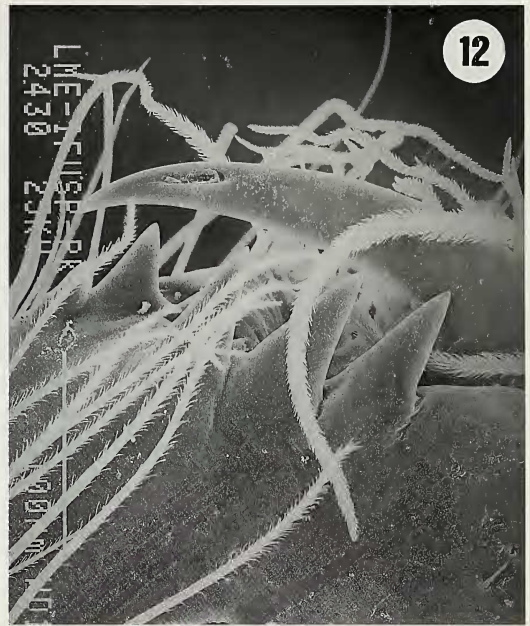
aceae). Spiders were most common in *E. azurea* (45.9% of 61 individuals). On the remaining plants occurrence was lower: 9.84% on *E. crassipes*, 6.56% on *E. paniculatus*, 1.64% on *N. amazonum*, 6.56% on *S. auriculata*, 9.84% on *P. fluitans*, 11.48% on *P. mertensii*, 6.56% on *L. inclinata*, and 1.64% on *P. stratiotes*.

Immatures and adults were found on aerial vegetative parts of the plants, but only immatures were seen in retreats made on damaged or coiled plant leaves. *Paradossenus corumba* adults build irregular, horizontal webs (Fig. 23) which can be simple (observed only on *Echinodoros paniculatus*) or double (on *Eichhornia azurea*, Fig. 23, and *E. crassipes*), in this case without threads connecting the two parts. Spaces were observed between the threads and the plant petiole apex area (see arrows in the Fig. 23). In addition, the web has sticky silk threads. When the web is double, the spider walks under it, surrounding the plant petiole, and passing under each of the

web parts through their spaces. In doing so, the spider is able to inspect the two parts of the web, sequentially.

Some spiders were found walking on a plant or among plants. When walking on the plant, it patrols all its aerial parts. To move from one plant to another, spiders can walk on the water surface or attach silk threads between plant leaves (in tall plants only, *Eichhornia azurea*, *E. crassipes*, *Echinodoros paniculatus* and *Panicum mertensii*).

*Paradossenus corumba* can capture its prey in two ways. In the first way, a prey (an araneid) was captured actively while *P. corumba* walked on a plant. In this case, the hunting strategy is "search" (*sensu* Alcock 1979). In the second way, when a grasshopper nymph (probably *Cornops* sp., Acrididae) and a Diptera were captured, the spider stayed immobile on the plant leaf, near the water surface, keeping its cephalothorax oriented toward the water, and captured the preys that dropped in front of it. This behavior is characteristic of a



Figures 11–14.—*Paradossenus corumba* new species, male. 11, Chelicerae, anterior surface; 12, Cheliceral teeth; 13, Tarsal tricobothrium, dorsal view; 14, Epigynum of female in ventral view (Scale bars for Figs. 11, 12, 14 = 100 $\mu$ m; Fig. 13 = 1 $\mu$ m).

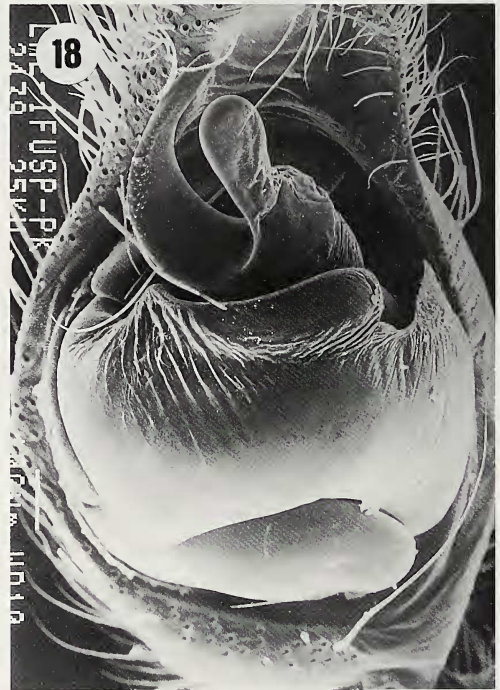
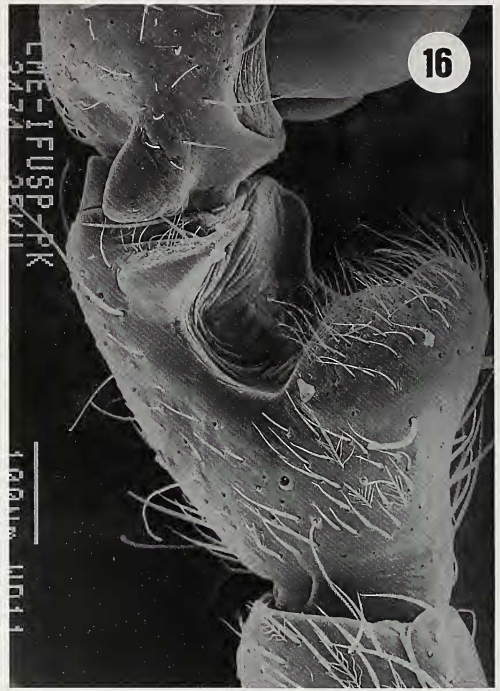
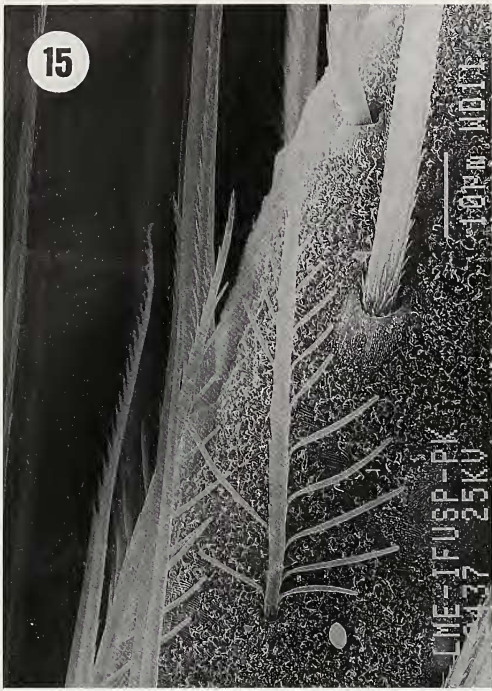
“sit-and-wait” predator (Wise 1993). In both cases, the spider fed on the prey after immobilizing it with a single bite.

The prey capture strategies observed for *P. corumba* indicate versatility in types of prey that are utilized. This versatility is poorly reported for spider species, with the exception of the salticid *Portia fimbriata* (Doleschall 1859) (see Jackson 1982; Jackson & Blest

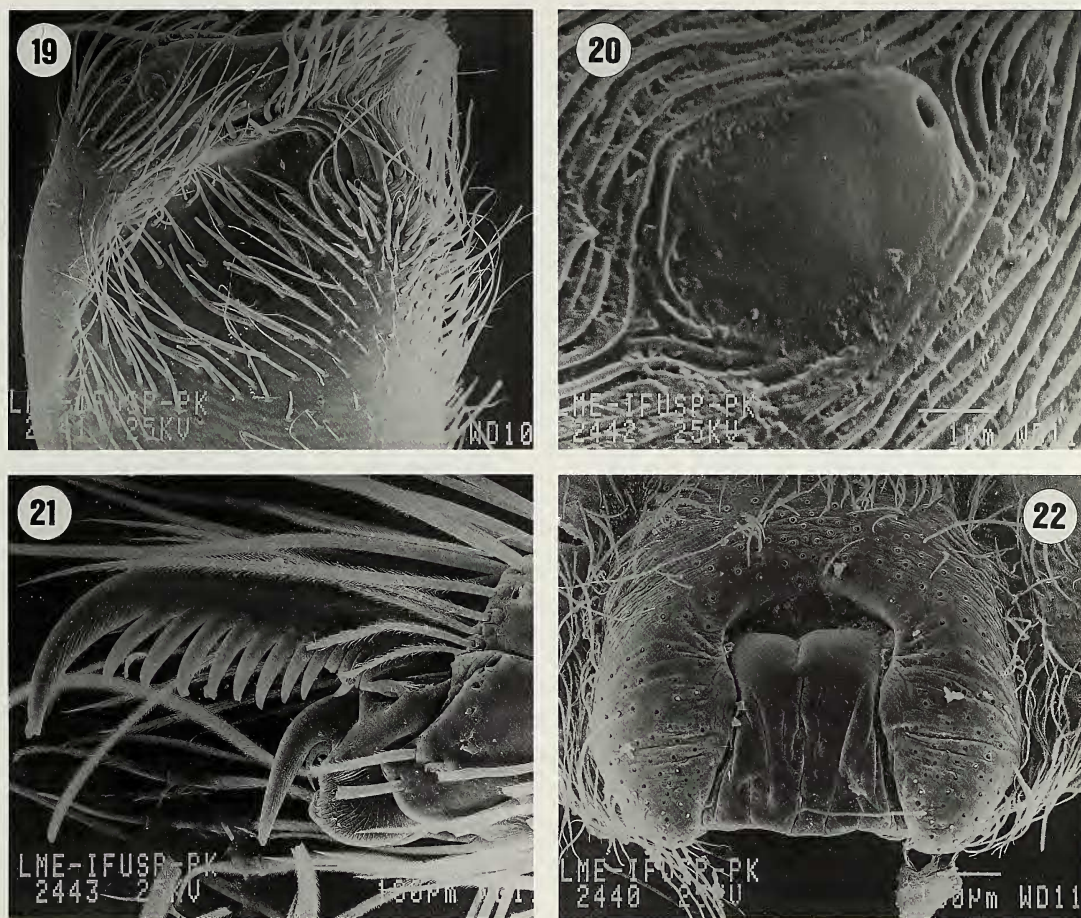
1982) and the araneid *Parawixia bistriata* (Rengger 1836) (see Sandoval 1994).

**Distribution.**—Mato Grosso do Sul, Brazil.

**Material examined.**—**BRAZIL.** *Mato Grosso do Sul:* Porto Cercado, 4♀2imm, August 1992 (A.A. Lise & A. Bräul col.) (MCTP 2496; IBSP 6900); Corumbá Abobral sub-region, Passo da Lontra, 2♂1♀3imm, 1996, J. Raizer col. (IBSP 13757-13759; ZUFMS).



Figures 15–18.—Species of *Paradossenus*. 15–17. *Paradossenus corumba*, male. 15, Tibia I, lateral view, plumose setae; 16, Palpal tibia, retrolateral view; 17, Palpal bulb, ventral view. 18, *P. longipes*, male, palpal bulb, ventral view. (Scale bars for Fig. 15 = 10 $\mu$ m; Figs. 16–18 = 100 $\mu$ m).



Figures 19–22.—*Paradosenus longipes*, male. 19, Chelicerae, anterior surface; 20, Tarsal organ; 21, Leg I, tarsal claws; 22, Epigynum of female from Mato Grosso, in ventral view. (Scale bars for Figs. 19; 21–22 = 100 $\mu$ m; Fig. 20 = 1 $\mu$ m).

*Paradosenus minimus* (Mello-Leitão)

Figs. 7, 8

*Xingusiella minima* Mello-Leitão 1940: 23, fig. 1 (female holotype with egg sac, from Rio Xingu, Pará, Brazil, H. Leonardos col., MNRJ 585, examined); Roewer 1954: 144.

*Paradosenus minimus*: Sierwald 1993: 57.

**Diagnosis.**—*Paradosenus minimus* is closest to *P. corumba* due to the rounded border of lateral lobes, but may be distinguished by the epigynum with a short and narrow median elevation on the middle field (Fig. 7) and the globose secondary spermathecae (Fig. 8).

**Description.**—*Female*: (holotype). Coloration: carapace orange to gray (very discolored). Chelicerae red-brown. Endites and labium gray and white at tip. Sternum, legs and pedipalps yellowish. Abdomen dorsally gray-

green, with an anterior dorsal grayish strip and a black band surrounding the spinnerets. Ventrally white. Total length 3.50. Carapace 1.60 long, 1.20 wide. Clypeus 0.12 high. Eye diameters and interdistances: AME 0.08, ALE 0.07, PME 0.12, PLE 0.13; AME-AME 0.05, AME-ALE contiguous, PME-PME 0.12, PME-PL 0.21, ALE-PL 0.27. MOQ length 0.27, front width 0.11, back width 0.37. Chelicerae with 3 promarginal teeth and 3 retro-marginal denticles. Sternum 0.85 long, 0.55 wide. Abdomen 1.70 long. Leg measurements: I and II absent. III -femur 1.05; patella 0.35; tibia 0.80; metatarsus 1.00; tarsus 0.40; total 3.60. IV -1.90; 0.50; 1.40; 1.80; 0.65; 6.25. Spination: legs III-IV—tibia v2-2-2. Epigynum: epigynal folds broad, with an anterior widening, rounded; middle field posteriorly

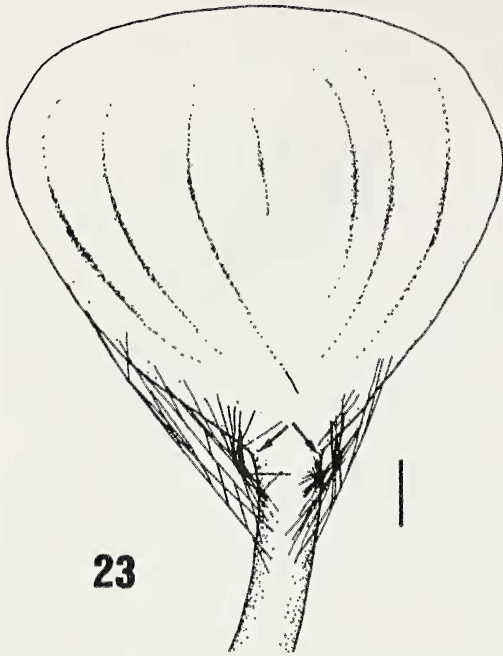


Figure 23.—Typical double web of *Paradosenus corumba* adults, on leaf of *Eichhornia azurea* (Pontederiaceae). Observe the spaces between threads of each web parts and the plant leaf (arrows) used by the spider during the web inspection. Scale bar = 1 cm.

short, with short and narrow median elevation; lateral lobes posteriorly rounded (Fig. 7). Vulva: wing of copulatory duct slightly sclerotized, short and subquadrangular; true spermathecae slender without distinct head; globose secondary spermathecae, without distinct head stalk division (Fig. 8).

**Natural history.**—The egg sac, reported by Mello-Leitão (1940) as globose, is similar to those found in the Lycosidae, attached to spinnerets. Also present, as in *P. longipes*, are two discs, the upper larger than the lower disc, vault shaped, with the central scar where it was attached to spinnerets, the lower disk smaller and flat, with 20–25 shiny round eggs.

**Distribution.**—North of Mato Grosso, Brazil.

**Material examined.**—Only the type.

*Paradosenus longipes* (Taczanowski)

Figs. 9, 10; 18–22

*Dolomedes longipes* Taczanowski 1874: 88 (♀ lectotype and ♂ paralectotype, “Polska Academy of Sciences”, designated by Sierwald (1993), of

Cayena, 04°055'N, 52°18'W, Depto Cayena, Guiana Francesa, K. Jelski col., not examined).

*Paradosenus nigricans* Pickard-Cambridge 1903: 155 (male holotype and female paratype, “The Natural History, British Museum” BMNH-1898.5.5.101-2, from Buyassu, Paraná e Breves, Maranhão, Brazil, not examined); Roewer 1954: 139; Bonnet 1958: 3325; Caporiacco 1948: 630; Sierwald 1990: 35; 1993: 59 (syn.).

*Paradosenus longipes*: Caporiacco 1948: 630.

*Paradosenus taczanowskii* Caporiacco 1948: 631 (2♂ syntypes, “Muzeo di Zoologia di Specola, Firenze”, from Two Mouths, Essequibo, Guiana and Tibicuri-Cuyaha, Demerara, Guiana, not examined); Sierwald 1990: 35.

**Morphological notes.**—Chelicerae in Fig. 19 showing the distinct elongated groove; tarsal claws long, bearing 11–12 teeth, inferior tarsal claw on short tarsal onychium with slender ridges and presenting an elongated tooth (Fig. 21); tarsal organ oval with small and circular opening (Fig. 20). Copulatory organs: no variation was found in the male palp collected in the northern region of South America (see Sierwald 1990, fig. 34) and those collected from the south of Brazil (Fig. 18). Among the females, no variation was found in the external plate of the epigynum (Fig. 22), but examining the internal structures, significant variation was detected in the form of the wings of copulatory ducts, which are very enlarged in the females from Manaus, Amazonas (Fig. 9) and narrowed in the females from Rio Grande do Sul (Fig. 10). Despite these variations we consider all specimens as *P. longipes*.

**Distribution.**—Previously known from Venezuela, Guiana, Colombia, Bolivia, Peru and north of Brazil (Sierwald 1993: 62, 63). The new records extend the range of this species to south of Brazil and north of Argentina.

**New records.**—**BRAZIL.** *Acre*: Serra do Divisor National Park (Camp), 1♀, 14 November 1996 (R.S. Vieira col.) (IBSP 9305); *Amazonas*: Manaus, Reserva Florestal Adolfo Ducke, 1♂, 8 August 1992 (S. Darwich col.) (MCTP 2846); 1♀, 8 April 1992 (S. Darwich col.) (MCTP 2718); 1♀, 8 April 1992 (U. Barbosa col.) (MCTP 2719); *Mato Grosso*: Confluency Rivers Koluene and Xingu, 1♂3♀ (J.C. Carvalho col.) (MNRJ 13446; IBSP 13756); *Bahia*: Iraquara, Pratinha (23°11'S, 48°12'W), 2♀, 5 May 1998 (L.S. Rocha col.) (IBSP 20781); *São Paulo*: Mogi das Cruzes, Rio Tietê, 1♀, July-August 1997 (R. Martins col.) (IBSP 11970); *Paraná*: Candói/Mangueirinha, Reservatório do Rio Jordão,



Usina Hidrelétrica de Segredo, 1 ♀, 29 April 1996 (A.F. Moraes & M.L. Javorowski col.) (IBSP 7142); Dois Vizinhos/Cruzeiro do Iguaçu, Foz do Chopin, 1 ♀, 8–15 November 1998 (Eq. IBSP col.) (IBSP 21247); *Rio Grande do Sul*: Rio Uruguai (Rodovia BR 153), 1 ♂, February 1989 (Eq. PUC col.) (MCTP 1296); São Leopoldo, 1 ♀, 25 March 1983 (C.J. Becker col.) (MCN 11518); Triunfo, 1 ♀ with egg sac, 12 January 1989 (H.A. Gastal col.) (MCN 18086); **ARGENTINA**. *Entre Misiones e Corrientes*: 1 ♀, 03–12 January 1989 (Eq. Garabi col.) (MCTP 1289).

#### ACKNOWLEDGMENTS

We would like to thank Prof. Pedro Kyohara and Miss Simone Perche de Toledo (USP) for the scanning electron micrographs, Cristina A. Rheims for the English language revision and the curators for loaning material for this study. The illustration of *Paradossenus corumba* web drawing was provided by Vander M. Jesus. Thanks also to P. Sierwald and J. Berry for editorial review. This work was supported by CNPq grants (#530476/93.2; 522616/95.0 and 300169/96-5).

#### LITERATURE CITED

- Alcock, J. 1979. *Animal Behavior. An Evolutionary Approach*. Sinauer, Sunderland, Massachusetts.
- Brescovit, A.D. & H. Höfer. 1994. *Heidrunea*, a new genus of the spider subfamily Rhoicininae (Araneae, Trechaleidae) from central Amazonia, Brazil. *Andrias*, 13:71–80.
- Caporiacco, L. 1948. Arachnida of British Guiana collected in 1931 and 1936 by Professors Beccari and Romiti. *Proc. Zool. Soc. London*, 118(3): 607–747.
- Carico, J.E. 1993. Revision of the genus *Trechalea* Thorell (Araneae, Trechaleidae) with a review of the taxonomy of the Trechaleidae and Pisauridae of the western hemisphere. *J. Arachnol.*, 21:226–257.
- Jackson, R.R. 1982. The biology of *Portia fimbriata*, a web-building jumping spider (Araneae, Salticidae) from Queensland: intraspecific interactions. *J. Zool. London*, 196:295–305.
- Jackson, R.R. & A.D. Blest. 1982. The biology of *Portia fimbriata*, a web-building jumping spider (Araneae, Salticidae) from Queensland: utilization of webs and predatory versatility. *J. Zool., London*, 196:255–293.
- Lehner, P.N. 1979. *Handbook of Ethological Methods*. Garland, New York.
- Mello-Leitão, C.F. de. 1940. Aranhas do Xingu colhidas pelo dr. Henry Leonardos. *Ann. Acad. Brasileira Sc.*, 12(1):21–32.
- Pickard-Cambridge, F.O. 1903. On some new species of spiders belonging to the families Pisauridae and Senoculidae; with characters of a new genus. *Proc. Zool. Soc. London*, 1903 (1):151–168.
- Sandoval, C.P. 1994. Plasticity in web design in the spider *Parawixia bistriata*: a response to variable prey type. *Funct. Ecol.*, 8:701–707.
- Sierwald, P. 1990. Morphology and homologous features in the male palpal organ in Pisauridae and other spider families, with notes on the taxonomy of Pisauridae (Arachnida: Araneae). *Nemouria*, 35:1–59.
- Sierwald, P. 1993. Revision of the spider genus *Paradossenus*, with notes on the family Trechaleidae and the subfamily Rhoicininae (Araneae, Lycosoidea). *Rev. Arachnol.*, 10(3):53–74.
- Wise, D.H. 1993. *Spiders In Ecological Webs*. Cambridge Univ. Press, Cambridge.

*Manuscript received 6 October 1998, revised 1 July 1999.*